"Impact of Temperature, pH and Hardness on Different Life Stages of Neon Tetra, *Paracheirodon innesi* (MAYERS, 1936)"

A

Synopsis

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Short resume/Synopsis of Ph.D. Topic

Name of topic: Impact of temperature, pH and hardness on different life stages of Neon tetra, *Paracheirodon innesi* (MAYERS, 1936)

1. **Abstract of proposed plan/problem :-**

Ornamental fish keeping is the second most popular hobby in the world after photography and ornamental fishes are the most popular pets liked by people in the world. The first public aquarium was opened at Regent's Park in England in the year 1853, as aquarium fish keeping began in the year 1805. Thereafter, aquaria keeping picked up further and more than 500 public aquaria are functioning worldwide. The global market for ornamental fishes comprising 99% of market home hobbyist (Swain et al., 2003).

World export of ornamental fish is about US$ 350 million in the year 2007. The US market is currently the largest single market in the world, accounting for US$ 39.7 million worth of ornamental fishes imported in the year 2002. On the other hand, Singapore is the world's largest exporter contributing 22% of total exports, followed by Malaysia, the Czech Republic, and Indonesia (Singh, 2005). Asia is by far the biggest exporter contributing 59.1% of worlds export. The major Asian countries involved in the export of ornamental fish are Singapore at top rank with 38.5% share followed by Malaysia (13.3%), Indonesia (12.7%), China (10.2%), Japan (7.1%), the Philippines (6.0%), SriLanka (5.5%), Thailand (3.1%), Taiwan (1.6%) and India (1.2%) (Singh and Dey, 2003).

The natural habitat of this species is in the Upper Amazon basin, South America, especially the Putumaya River and Rio Purus (Myers, 1936). They are prevalent to rivers and streams in south eastern Colombia, Eastern Peru and Western Brazil. They inhabit the streams of the Rio Putumaya in Peruvian Amazon near Lquitoes and Yarrapa River where they travel about in schools sometimes accomplish into the hundreds of thousands. Neon tetra comes from waters which are void of minerals (Geisler, 1979; Weitzman and Fink, 1983). The neon tetra is described, 40 mm long, luminously coloured freshwater fish

with a dark olive-green back over a silver-white abdomen. The fish is characterized by ashimmeringblue-green lateral body stripe that covers from the head to the base of the adipose fin. The blue streak on the lateral line from head to tail changing from blue when normal, to yellow-green when frightened, to indigo-blue when spawning. A broad, shining red stripe begins at the middle of the body and extends posteriorly to the base of the caudal fin. The fins are transparent and colorless (Myers, 1936).

They reach a maximum size of 40 mm but the majorities are 25 mm and less. The life span of neon tetra is nearly 1.5 years while 3 years has been documented. They will enthusiastically accept all types of live food such as mosquito larvae, tubifex worms,
Cladocerans and formulated feeds. They prefer soft, clear and slightly acidic water with temperature between 24 to 26ºC (Axelrod, 1978).

Neon tetra gets good price in ornamental fish market. Although there is great demand for this species, yet breeding protocol of neon tetra has not been understood scientifically.

2. Review of literature and development in the subject :

(Previous work done in relevant area)

The neon tetra *Paracheirodon innesi* (Myers, 1936) is one of the most valuable species in the ornamental fish trade (Wietzman, Fink 1987). Most fish of this species available in the market are imported from South-East Asia, where they are raised in the fish farms, or from South America, where they are collected from the wild (Chapman et al. 1998).

Axelrod (1967 and 1978) had labeled methods for breeding of Neon tetra, Flame tetra, Glow light tetra, Cardinal tetra, Flash tetra, Black widow tetra. He mentioned the ideal conditions and food required for rearing of Neon tetra, *Paracheirodon innesi*. Neon tetra prefers soft, clear and slightly acidic water with temperature between 24^0C to 26^0C.

Sadavarte (1996) had studied the maturation, breeding and post-embryonic rearing of Rosy barb, Barbus conchonius. In this study fecundity, egg fertilization rate, hatching rate, size of hatchlings and water parameter during spawning and egg incubation were recorded. He was also evaluating the effect of different chemicals and hormones on growth of Rosy barb, Barbus conchonius.

Chapman et al. (1998) described the method for controlled spawning of the neon tetra that can be adopted to domestic commercial production. The pH of water was adjusted with phosphoric acid to maintain it between 5.5 to 6.5. A spawning substrate (nylon brush) was used for egg deposition. Fish reared in the laboratory had a significantly higher number of larvae (82 larvae/female) than brood stock collected from the wild or cultured abroad (28 larvae/female). The domestic population reached sexual maturity at 5-6 months of age and brood fish pairs produced an average of 82 larvae every two weeks over a period of one year.

A. polo (1991) describe the optimal temperature range for embryonic development of Sparusaurata. Hatching rate was maximal (91–95%) from 14 to 26°C. Eggs did not hatch at 12 and 30°C. Abnormalities at hatching are usual outside the 16–22°C range

Cole et al. (1999) has cited the ideal conditions required for breeding and larval rearing of Lemon tetra, Hyphessobrycon pulchripinnis with maintaining temperature range 24^0-26^0C.
Cole and Haring (1999) has stated the optimal conditions required for breeding and larval rearing of Serpae tetra, Hyphessobrycon serape with maintaining temperature range 24^0- 26.5^0C.

Annually 12–15 million neon-tetras collected from the wild are exported; this is about 80% of the total market of ornamental fish of the Amazon State (Chao 2001). This situation led to the fear that this species may be doomed to extinction (Bayley, Petrere1989). For this reason the propagation methods of

different aquarium fish in captivity can be developed and published (Olivier, Keiser 1997, Goshet al. 2007).

Generally, tetras prefer soft, slightly acid water which resembles to natural conditions. The water of streams and rivers in Amazon region are poor in nutrients and minerals but rich in humic acids (Junk, Soares2001).

Lim et al. (2002) conducted two series of feeding experiment to study feasibility of using decapsulated Artemia cysts for direct feeding to ornamental fishes. The first series evaluated the dietary values of the dried and the brine decapsulated Artemia cysts against two conventional live food organism, Artemia nauplii and Moina for adults and fry of the guppy, Poecilia reticulata Peters. In second series, brine cysts were used for feeding to fry of four other important ornamental fish species, viz. platy*, Xiphophorus maculatus* (Guenther), sword-tail, *X. helleri* (Heckel), molly, *Poecilia sphenops* (Cuvier and Vaenciennes) and black neon tetra, *Hyphessobrycon herbertaxelrodi* (Gery), and the results were compared with those fed with Moina. The performances of diets were evaluated on the basis of stress resistance, growth and survival of the fish. These finding indicated that decapsulated cysts could be used as a substitute for Artemia nauplii or Moina in freshwater ornamental fish culture.

The high market pressure stimulated the development of breeding and rearing methods of tetras (Kucharczyket al. 2008b, Kupren et al. 2008), but because the aquaculture of this species is a valuable business, only some limited data concerning such information like methods of spawning are published (Chapman et al. 1998). , therefore not available for reference.

The aim of this study is to breed neon tetra under controlled temperature and to standardize the breeding with best output at hatchling, spawn and fry stage.

3. Objective of Research / Proposed hypothesis :

- To determine the effect of different temperature, pH and Hardness on breeding behavior, hatching rate and larval rearing of Neon tetra (*Paracheirodon innesi*).

- To study physiological and biological aspects in Neon tetra (*Paracheirodon innesi*).

4. Methodology to be adopted :

- Literature Review.
- Procurement of brooders.
- Acclimatization of semi adult Neon tetra (*Paracheirodon innesi*).
- Procurement of accessories necessary for different temperature regimes.
- Maintenance of room and water temperature according to the treatments.
- Breeding trials and larval rearing.
- Statistical analysis of the data.
- Thesis writing and submission

5. importance of study / Society application :

❖ **National status :**

India is presented with a wide variety of ornamental fish. The ornamental fish sector is getting momentum now days in the country. It is yet to claim for itself a prominent position in the international field. The country exported US$ 0.7 million (Indian Rupees 30 million) worth of ornamental fish during the year 2003-04 (Bojan, 2005).

The native varieties currently find their way to international market, while the domestic trade of freshwater ornamental fish is mainly dependent on the exotic varieties of fish. More than 200 varieties of exotic freshwater ornamental fish species of Cichlids, Poecilids, Cyprinids Characins and Anabantids are bred and sold in the domestic market (Velyudhan, 2006).

There are many groups among ornamental fishes such as carps, barbs, tetras, loaches, and gouramies. Barbs are the members of family Characidae, popularly called as tetras. They are dispersed in Central and South America

and in Africa. Although, India has no indigenous tetras, so far all the tetras are kept as hobby and very much popular aquarium fish.

❖ **International status :**

The neon tetra is the most widespread and colourful aquarium fish among the tetras. They are frequently mentioned as aristocrats of the small aquarium. It is also termed as jewel in the aquarium tank. Their colour is magnificent and a school of neon tetras competing about catching beams of sunlight is quite a sight. Composed with the guppy Poecilia reticulata, the neon tetra has become one of the most popular ornamental fish kept in USA household. During a single month, an average of 1.8 million of neon tetra, with an estimated value of US$ 175000 were imported into United States for aquarium trade (Chapman et al., 1997).

❖ **Significance of the study :**

Present study will gives the optimum temperature at which the Neon tetra can successfully breed with high fecundity. Moreover study will determine the percentage of hatching of eggs at particular temperatures. In addition study of physiological and biological aspects and suitable temperature at which the larvae can be reared from spawn to fry.

The finding will be present in the form of thesis.

6. Proposed work plan / formulation and structure of study :

Year wise plan of work and targets to be achieved:

First year: introduction, referencing, methodology, visit to various location ornamental fish market, shops, commercial breeders, for collection of P. innesi. Collection and rearing of fishes.

Second year: set up of experiment, breeding trials, eggs hatching trials and larval rearing trials.

Third year: study of length weigh relationship, mortality rate, larval survival and different temperature, physiological and biological aspects, data analysis, typing and submission of thesis.

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